

What is claimed is:

1 1. A video display device comprising:
2 a red color light source to emit red color light;
3 a green color light source to emit green color light;
4 a blue color light source to emit blue color light;
5 at least one spatial light modulator to spatially modulate,
6 according to a video signal for a red color, a video signal for
7 a green color, and a video signal for a blue color, said light
8 fed from said red color light source, said light fed from said
9 green color light source, and said light fed from said blue color
10 light source;

11 a selection controller to select a combination of a video
12 signal for controlling said spatial light modulator and said light
13 to be modulated; and

14 a light quantity controller to control a time mean value
15 of luminous flux of light to be modulated by said spatial light
16 modulator.

1 2. The video display device according to Claim 1, wherein, in
2 said spatial light modulator, following equations hold among
3 chromaticity coordinates (xr0, yr0), (xg0, yg0), and (xb0, yb0)
4 for light of a red color, a green color, and a blue color in
5 specifications of colorimetry by which a video signal is defined
6 according to CIE (Commision Internationale de l'Eclairage) 1931
7 standard colorimetric system, a time mean value of luminous flux
8 of each of said red color, said green color, and said blue color,
9 and chromaticity coordinates of said red color light, said green
10 color light, and said blue color light defined in said standard

11 colorimetric system; said following equations comprising:
12

$$13 \quad xr0 = (xr \times Lrr / yr + xg \times Lrg / yg + xb \times Lrb / yb) / (Lrr / yr + Lrg / yg + Lrb / yb)$$
$$15 \quad yr0 = (Lrr + Lrg + Lrb) / (Lrr / yr + Lrg / yg + Lrb / yb)$$
$$16 \quad xg0 = (xr \times Lgr / yr + xg \times Lgg / yg + xb \times Lgb / yb) / (Lgr / yr + Lgg / yg + Lgb / yb)$$
$$18 \quad yg0 = (Lgr + Lgg + Lgb) / (Lgr / yr + Lgg / yg + Lgb / yb)$$
$$19 \quad xb0 = (xr \times Lbr / yr + xg \times Lbg / yg + xb \times Lbb / yb) / (Lbr / yr + Lbg / yg + Lbb / yb)$$
$$21 \quad yb0 = (Lbr + Lbg + Lbb) / (Lbr / yr + Lbg / yg + Lbb / yb)$$

22 wherein:

23 said Lrr represents a time mean value of luminous flux of red color
24 light to be modulated according to a video signal for a red color,
25 said Lgr represents a time mean value of luminous flux of red color
26 light to be modulated according to a video signal for a green color,
27 said Lbr represents a time mean value of luminous flux of red color
28 light to be modulated according to a video signal for a blue color,
29 said Lrg represents a time mean value of luminous flux of green
30 color light to be modulated according to a video signal for a red
31 color,
32 said Lgg represents a time mean value of luminous flux of green
33 color light to be modulated according to a video signal for a green
34 color,
35 said Lbg represents a time mean value of luminous flux of green
36 color light to be modulated according to a video signal for a blue
37 color,
38 said Lrb represents a time mean value of luminous flux of blue
39 color light to be modulated according to a video signal for a red

40 color,
41 said Lgb represents a time mean value of luminous flux of blue
42 color light to be modulated according to a video signal for a green
43 color,
44 said Lbb represents a time mean value of luminous flux of blue
45 color light to be modulated according to a video signal for a blue
46 color,
47 dsid (xr, yr), said (xg, yg), and said (xb, yb) represent
48 chromaticity coordinates of said red color light, said green color
49 light, and said blue color light, respectively, according to said
50 standard colorimetric system.

1 3. The video display device according to Claim 2, wherein
2 following equations hold between chromaticity of coordinates (xr0,
3 yr0), (xg0, yg0), and (xb0, yb0) of light of, respectively, red,
4 green, and blue colors in specifications of colorimetry by which
5 a video signal is defined according to said standard colorimetric
6 system and chromaticity coordinates (xw, yw) of light of a
7 standard white color in specifications of colorimetry by which
8 a video signal is defined according to CIE (Commision
9 Internationale de l'Eclairage) 1931 standard colorimetric
10 system:

11

12 $xw = (xr0 \times Lr/yr0 + xg0 \times Lg/yg0 + xb0 \times Lb/yb0) / (Lr/yr0 + Lg/yg0 + Lb/yb0)$

14 $yw = (Lr + Lg + Lb) / (Lr/yr0 + Lg/yg0 + Lb/yb0)$

15

16 wherein:

17 said Lr is defined to be Lrr + Lrg + Lrb,

18 said Lg is defined to be Lgr + Lgg + Lgb, and
19 said Lb is defined to be Lbr + Lbg + Lbb.

1 4. The video display device according to Claim 1, wherein, in
2 said spatial light modulator, following equations hold between
3 chromaticity coordinates (xr, yr), (xg, yg), and (xb, yb) of,
4 respectively, red color light, green color light, and blue color
5 light according to said CIE (Commission Internationale de
6 l'Eclairage) 1931 standard colorimetric system and chromaticity
7 coordinates (xw, yw) of a standard white color in specifications
8 of colorimetry by which a video signal is defined as:

9

10 $xw = (xrl \times Lr/yrl + xgl \times Lg/ygl + xbl \times Lb/ybl) / (Lr/yrl + Lg/ygl + Lb/ybl)$
11

12 $yw = (Lr + Lg + Lb) / (Lr/yrl + Lg/ygl + Lb/ybl)$

13

14 wherein:

15 said Lrr represents a time mean value of luminous flux of red color
16 light to be modulated according to a video signal for a red color,
17 said Lgr represents a time mean value of luminous flux of red color
18 light to be modulated according to a video signal for a green color,
19 said Lbr represents a time mean value of luminous flux of red color
20 light to be modulated according to a video signal for a blue color,
21 said Lrg represents a time mean value of luminous flux of green
22 color light to be modulated according to a video signal for a red
23 color,
24 said Lgg represents a time mean value of luminous flux of green
25 color light to be modulated according to a video signal for a green
26 color,

27 said Lbg represents a time mean value of luminous flux of green
28 color light to be modulated according to a video signal for a blue
29 color,
30 said Lrb represents a time mean value of luminous flux of blue
31 color light to be modulated according to a video signal for a red
32 color,
33 said Lgb represents a time mean value of luminous flux of blue
34 color light to be modulated according to a video signal for a green
35 color,
36 said Lbb represents a time mean value of luminous flux of blue
37 color light to be modulated according to a video signal for a blue
38 color, and
39 wherein:
40 said Lr is defined to be Lrr + Lrg + Lrb,
41 said Lg is defined to be Lgr + Lgg + Lgb,
42 said Lb is defined to be Lbr + Lbg + Lbb,
43 said xrl is defined to be $(xr \times Lrr/yr + xg \times Lrg/yg + xb \times Lrb/yb)$
44 / $(Lrr/yr + Lrg/yg + Lrb/yb)$,
45 said yrl is defined to be $(Lrr + Lrg + Lrb) / (Lrr/yr + Lrg/yg$
46 $+ Lrb/yb)$
47 said xgl is defined to be $(xr \times Lgr/yr + xg \times Lgg/yg + xb \times Lgb/yb)$
48 / $(Lgr/yr + Lgg/yg + Lgb/yb)$
49 said ygl is defined to be $(Lgr + Lgg + Lgb) / (Lgr/yr + Lgg/yg$
50 $+ Lgb/yb)$
51 said xbl is defined to be $(xr \times Lbr/yr + xg \times Lbg/yg + xb \times Lbb/yb)$
52 / $(Lbr/yr + Lbg/yg + Lbb/yb)$ and
53 said ybl is defined to be $(Lbr + Lbg + Lbb) / (Lbr/yr + Lbg/yg$
54 $+ Lbb/yb)$

1 5. The video display device according to Claim 1, wherein
2 following expressions hold:

3

4 $P_{rr} = P_{gr} = P_{br}$

5 $P_{rg} = P_{gg} = P_{bg}$

6 $P_{rb} = P_{gb} = P_{bb}$

7

8 Wherein:

9 Said P_{rr} , said P_{gr} , and said P_{br} represent luminous flux of red
10 color light to be modulated according to a video signal for a red
11 color, a video signal for a green color, and a video signal for
12 a blue color, respectively,

13 Said P_{rg} , said P_{gg} , and said P_{bg} represent luminous flux of green
14 color light to be modulated according to a video signal for a red
15 color, a video signal for a green color, and a video signal for
16 a blue color, respectively, and

17 Said P_{rb} , said P_{gb} , and said P_{bb} represent luminous flux of blue
18 color light to be modulated according to a video signal for a red
19 color, a video signal for a green color, and a video signal for
20 a blue color, respectively.

1 6. The video display device according to Claim 1, wherein a
2 period is provided during which all light sources for each color
3 are turned OFF during one frame period.

1 7. The video display device according to Claim 1, wherein a
2 light source for said red color light, said green color light,
3 said blue color light, or said white color light comprises a light
4 emitting diode.

1 8. The video display device according to Claim 7, wherein said
2 light source for said red color light, said green color light,
3 said blue color light, or said white color light comprises a
4 plurality of said light emitting diodes.

1 9. A video display device comprising:

2 a light applying unit to adjust luminous flux of each of
3 a red color light, a green color light, and a blue color light
4 and to switch said red color light, said green color light, and
5 said blue color light in terms of time and to sequentially emit
6 said red color light, said green color light, and said blue color
7 light;

8 a spatial light modulator to spatially modulate light fed
9 from said light applying unit; and

10 wherein said light applying unit is controlled so that, when
11 luminous flux of said red color light being emitted while said
12 spatial light modulator is driven according to a video signal for
13 a red color is expressed as P_r , when luminous flux of said green
14 color light being emitted while said spatial light modulator is
15 driven according to a video signal for a green color is expressed
16 as P_g , and when luminous flux of said blue color light being emitted
17 while said spatial light modulator is driven according to a video
18 signal for a blue color is expressed as P_b , both said green color
19 light having luminous flux of $K \times P_g$ (k being a coefficient and
20 $0 \leq k \leq 1$ same as above) and said blue color light having luminous
21 flux of $K \times P_b$ together with said red color light are applied when
22 said spatial light modulator is driven according to said video
23 signal for a red color, both said blue color light having luminous
24 flux of $K \times P_b$ and said red color light having luminous flux of

25 K×Pr together with said green color light are applied when said
26 spatial light modulator is driven according to said video signal
27 for a green color and both said red color light having luminous
28 flux of K×Pr, and said green color light having luminous flux
29 of K×Pg together with said blue color light are applied when said
30 spatial light modulator is driven according to said video signal
31 for a blue color.

1 10. The color-sequence-type video display device according to
2 Claim 9, wherein, in said light applying unit, a value of said
3 coefficient k is configured to be able to be changed.

1 11. The video display device according to Claim 9, wherein a
2 light source for said red color light, said green color light,
3 said blue color light, or said white color light comprises a light
4 emitting diode.

1 12. The video display device according to Claim 11, wherein said
2 light source for said red color light, said green color light,
3 said blue color light, or said white color light comprises a
4 plurality of said light emitting diodes.

1 13. A video display device comprising:
2 a light applying unit to adjust luminous flux of each of
3 red color light, green color light, and blue color light and to
4 switch said red color light, said green color light, and said blue
5 color light in terms of time and to sequentially emit said red
6 color light, said green color light, and said blue color light;
7 a spatial light modulator to spatially modulate light fed

8 from said light applying unit; and

9 wherein said light applying unit is controlled so that red
10 color light and white color light are applied to said spatial light
11 modulator while said spatial light modulator is driven according
12 to a video signal for a red color, a green color light and a white
13 color light are applied to said spatial light modulator while said
14 spatial light modulator is driven according to a video signal for
15 a green color, and a blue color light and a white color light
16 are applied to said spatial light modulator while said spatial
17 light modulator is driven according to a video signal for a blue
18 color.

1 14. The video display device according to Claim 13, wherein said
2 white color light is applied to said spatial light modulator
3 according to driving timing for said spatial light modulator by
4 said video signal for a red color, said video signal for a green
5 color, and said video signal for a blue color.

1 15. The video display device according to Claim 13, wherein said
2 white color light is being lighted all the time.

1 16. The video display device according to Claim 13, wherein
2 brightness of said white color light is configured to be able to
3 be changed by external control.

1 17. The video display device according to Claim 13, wherein a
2 light source for said red color light, said green color light,
3 said blue color light, or said white color light comprises a light
4 emitting diode.

1 18. The video display device according to Claim 17, wherein said
2 light source for said red color light, said green color light,
3 said blue color light, or said white color light comprises a
4 plurality of said light emitting diodes.

1 19. A video display device comprising:
2 a red color light source to emit red color light;
3 a green color light source to emit green color light;
4 a blue color light source to emit blue color light;
5 at least one spatial light modulating means to spatially
6 modulate, according to a video signal for a red color, a video
7 signal for a green color, and a video signal for a blue color,
8 said light fed from said red color light source, said light fed
9 from said green color light source, and said light fed from said
10 blue color light source;
11 a selection controlling means to select a combination of
12 a video signal for controlling said spatial light modulating means
13 and said light to be modulated; and
14 a light quantity control means to control a time mean value
15 of luminous flux of light to be modulated by said spatial light
16 modulating means.

1 20. The video display device according to Claim 19, wherein,
2 in said spatial light modulating means, following equations hold
3 among chromaticity coordinates $(xr0, yr0)$, $(xg0, yg0)$, and $(xb0,$
4 $yb0)$ for light of a red color, a green color, and a blue color
5 in specifications of colorimetry by which a video signal is
6 defined according to CIE (Commision Internationale de
7 l'Eclairage) 1931 standard colorimetric system, a time mean value

8 of luminous flux of each of said red color, said green color, and
9 said blue color, and chromaticity coordinates of said red color
10 light, said green color light, and said blue color light defined
11 in said standard colorimetric system; said following equations
12 comprising:

13

14
$$xr0 = (xr \times Lrr / yr + xg \times Lrg / yg + xb \times Lrb / yb) / (Lrr / yr + Lrg / yg$$

15
$$+ Lrb / yb)$$

16
$$yr0 = (Lrr + Lrg + Lrb) / (Lrr / yr + Lrg / yg + Lrb / yb)$$

17
$$xg0 = (xr \times Lgr / yr + xg \times Lgg / yg + xb \times Lgb / yb) / (Lgr / yr + Lgg / yg$$

18
$$+ Lgb / yb)$$

19
$$yg0 = (Lgr + Lgg + Lgb) / (Lgr / yr + Lgg / yg + Lgb / yb)$$

20
$$xb0 = (xr \times Lbr / yr + xg \times Lbg / yg + xb \times Lbb / yb) / (Lbr / yr + Lbg / yg$$

21
$$+ Lbb / yb)$$

22
$$yb0 = (Lbr + Lbg + Lbb) / (Lbr / yr + Lbg / yg + Lbb / yb)$$

23 wherein:

24 said Lrr represents a time mean value of luminous flux of red color
25 light to be modulated according to a video signal for a red color,
26 said Lgr represents a time mean value of luminous flux of red color
27 light to be modulated according to a video signal for a green color,
28 said Lbr represents a time mean value of luminous flux of red color
29 light to be modulated according to a video signal for a blue color,
30 said Lrg represents a time mean value of luminous flux of green
31 color light to be modulated according to a video signal for a red
32 color,

33 said Lgg represents a time mean value of luminous flux of green
34 color light to be modulated according to a video signal for a green
35 color,

36 said Lbg represents a time mean value of luminous flux of green

37 color light to be modulated according to a video signal for a blue
38 color,
39 said Lrb represents a time mean value of luminous flux of blue
40 color light to be modulated according to a video signal for a red
41 color,
42 said Lgb represents a time mean value of luminous flux of blue
43 color light to be modulated according to a video signal for a green
44 color,
45 said Lbb represents a time mean value of luminous flux of blue
46 color light to be modulated according to a video signal for a blue
47 color,
48 dsid (xr, yr), said (xg, yg), and said (xb, yb) represent
49 chromaticity coordinates of said red color light, said green color
50 light, and said blue color light, respectively, according to said
51 standard colorimetric system.

1 21. The video display device according to Claim 20, wherein
2 following equations hold between chromaticity of coordinates (xr0,
3 yr0), (xg0, yg0), and (xb0, yb0) of light of, respectively, red,
4 green, and blue colors in specifications of colorimetry by which
5 a video signal is defined according to said standard colorimetric
6 system and chromaticity coordinates (xw, yw) of light of a
7 standard white color in specifications of colorimetry by which
8 a video signal is defined according to CIE (Commision
9 Internationale de l'Eclairage) 1931 standard colorimetric
10 system:

11

12 $xw = (xr0 \times Lr/yr0 + xg0 \times Lg/yg0 + xb0 \times Lb/yb0) / (Lr/yr0 + Lg/yg0$
13 $+ Lb/yb0)$

14 $y_w = (L_r + L_g + L_b) / (L_r/y_{r0} + L_g/y_{g0} + L_b/y_{b0})$

15

16 wherein:

17 said L_r is defined to be $L_{rr} + L_{rg} + L_{rb}$,

18 said L_g is defined to be $L_{gr} + L_{gg} + L_{gb}$, and

19 said L_b is defined to be $L_{br} + L_{bg} + L_{bb}$.

1 22. The video display device according to Claim 19, wherein,
2 in said spatial light modulating means, following equations hold
3 between chromaticity coordinates (x_r, y_r) , (x_g, y_g) , and (x_b, y_b)
4 of, respectively, red color light, green color light, and blue
5 color light according to said CIE (Commission Internationale de
6 l'Eclairage) 1931 standard colorimetric system and chromaticity
7 coordinates (x_w, y_w) of a standard white color in specifications
8 of colorimetry by which a video signal is defined as:

9

10 $x_w = (x_{rl} \times L_r/y_{rl} + x_{gl} \times L_g/y_{gl} + x_{bl} \times L_b/y_{bl}) / (L_r/y_{rl} + L_g/y_{gl} + L_b/y_{bl})$

12 $y_w = (L_r + L_g + L_b) / (L_r/y_{rl} + L_g/y_{gl} + L_b/y_{bl})$

13

14 wherein:

15 said L_{rr} represents a time mean value of luminous flux of red color
16 light to be modulated according to a video signal for a red color,
17 said L_{gr} represents a time mean value of luminous flux of red color
18 light to be modulated according to a video signal for a green color,
19 said L_{br} represents a time mean value of luminous flux of red color
20 light to be modulated according to a video signal for a blue color,
21 said L_{rg} represents a time mean value of luminous flux of green
22 color light to be modulated according to a video signal for a red

23 color,
24 said Lgg represents a time mean value of luminous flux of green
25 color light to be modulated according to a video signal for a green
26 color,
27 said Lbg represents a time mean value of luminous flux of green
28 color light to be modulated according to a video signal for a blue
29 color,
30 said Lrb represents a time mean value of luminous flux of blue
31 color light to be modulated according to a video signal for a red
32 color,
33 said Lgb represents a time mean value of luminous flux of blue
34 color light to be modulated according to a video signal for a green
35 color,
36 said Lbb represents a time mean value of luminous flux of blue
37 color light to be modulated according to a video signal for a blue
38 color, and
39 wherein:
40 said Lr is defined to be Lrr + Lrg + Lrb,
41 said Lg is defined to be Lgr + Lgg + Lgb,
42 said Lb is defined to be Lbr + Lbg + Lbb,
43 said xrl is defined to be $(xr \times Lrr/yr + xg \times Lrg/yg + xb \times Lrb/yb)$
44 / $(Lrr/yr + Lrg/yg + Lrb/yb)$,
45 said yrl is defined to be $(Lrr + Lrg + Lrb) / (Lrr/yr + Lrg/yg$
46 $+ Lrb/yb)$
47 said xgl is defined to be $(xr \times Lgr/yr + xg \times Lgg/yg + xb \times Lgb/yb)$
48 / $(Lgr/yr + Lgg/yg + Lgb/yb)$
49 said ygl is defined to be $(Lgr + Lgg + Lgb) / (Lgr/yr + Lgg/yg$
50 $+ Lgb/yb)$
51 said xbl is defined to be $(xr \times Lbr/yr + xg \times Lbg/yg + xb \times Lbb/yb)$

52 / (Lbr/yr + Lbg/yg + Lbb/yb) and
53 said ybl is defined to be (Lbr + Lbg + Lbb) / (Lbr/yr + Lbg/yg
54 + Lbb/yb)

1 23. The video display device according to Claim 19, wherein
2 following expressions hold:

3

4 Prr = Pgr = Pbr
5 Prg = Pgg = Pbg
6 Prb = Pgb = Pbb

7

8 Wherein:

9 Said Prr, said Pgr, and said Pbr represent luminous flux of red
10 color light to be modulated according to a video signal for a red
11 color, a video signal for a green color, and a video signal for
12 a blue color, respectively,

13 Said Prg, said Pgg, and said Pbg represent luminous flux of green
14 color light to be modulated according to a video signal for a red
15 color, a video signal for a green color, and a video signal for
16 a blue color, respectively, and

17 Said Prb, said Pgb, and said Pbb represent luminous flux of blue
18 color light to be modulated according to a video signal for a red
19 color, a video signal for a green color, and a video signal for
20 a blue color, respectively.

1 24. A video display device comprising:

2 a light applying means to adjust luminous flux of each of
3 a red color light, a green color light, and a blue color light
4 and to switch said red color light, said green color light, and

5 said blue color light in terms of time and to sequentially emit
6 said red color light, said green color light, and said blue color
7 light;

8 a spatial light modulating means to spatially modulate
9 light fed from said light applying means; and
10 wherein said light applying means is controlled so that,
11 when luminous flux of said red color light being emitted while
12 said spatial light modulating means is driven according to a video
13 signal for a red color is expressed as P_r , when luminous flux of
14 said green color light being emitted while said spatial light
15 modulating means is driven according to a video signal for a green
16 color is expressed as P_g , and when luminous flux of said blue color
17 light being emitted while said spatial light modulating means is
18 driven according to a video signal for a blue color is expressed
19 as P_b , both said green color light having luminous flux of K
20 $\times P_g$ (k being a coefficient and $0 \leq K \leq 1$ same as above) and said
21 blue color light having luminous flux of $K \times P_b$ together with said
22 red color light are applied when said spatial light modulating
23 means is driven according to said video signal for a red color,
24 both said blue color light having luminous flux of $K \times P_b$ and said
25 red color light having luminous flux of $K \times P_r$ together with said
26 green color light are applied when said spatial light modulating
27 means is driven according to said video signal for a green color
28 and both said red color light having luminous flux of $K \times P_r$, and
29 said green color light having luminous flux of $K \times P_g$ together with
30 said blue color light are applied when said spatial light
31 modulating means is driven according to said video signal for a
32 blue color.

1 25. The color-sequence-type video display device according to
2 Claim 24, wherein, in said light applying means, a value of said
3 coefficient k is configured to be able to be changed.

1 26. A video display device comprising:
2 a light applying means to adjust luminous flux of each of
3 red color light, green color light, and blue color light and to
4 switch said red color light, said green color light, and said blue
5 color light in terms of time and to sequentially emit said red
6 color light, said green color light, and said blue color light;
7 a spatial light modulating means to spatially modulate
8 light fed from said light applying means; and
9 wherein said light applying means is controlled so that red
10 color light and white color light are applied to said spatial light
11 modulating means while said spatial light modulating means is
12 driven according to a video signal for a red color, a green color
13 light and a white color light are applied to said spatial light
14 modulating means while said spatial light modulating means is
15 driven according to a video signal for a green color, and a blue
16 color light and a white color light are applied to said spatial
17 light modulating means while said spatial light modulating means
18 is driven according to a video signal for a blue color.

1 27. The video display device according to Claim 26, wherein said
2 white color light is applied to said spatial light modulating
3 means according to driving timing for said spatial light
4 modulating means by said video signal for a red color, said video
5 signal for a green color, and said video signal for a blue color.

1 28. The video display device according to Claim 26, wherein said
2 white color light is being lighted all the time.